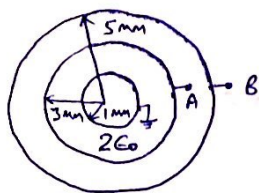


Capacitance calculation

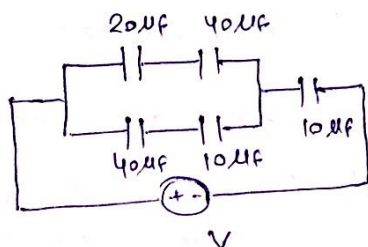
Q-1. Three concentric spherical conductors are as shown in fig.



The dielectric between inner two sphere has permittivity of $2\epsilon_0$.

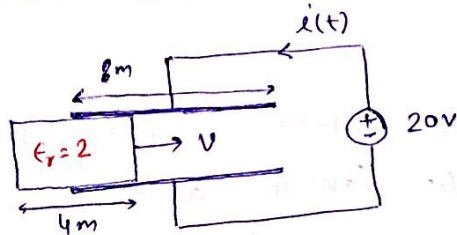
The capacitance of the system between A & B is $\underline{\hspace{2cm}} \epsilon_0 f$

Q-2. There are three capacitors A, B and C. The breakdown strength of capacitor A is 40 kV; for capacitor B is 50 kV and for capacitor C is 30 kV. Capacitor A is of 20 μF ; capacitor B is of 10 μF and capacitor C has capacity of 40 μF . Now these three capacitors are connected as shown below



Find maximum value of V that can be applied such that no capacitor breakdown takes place $\underline{\hspace{2cm}} \text{ kV}$.

Q-3. A dielectric slab of Area 40 m^2 and thickness 10 mm is inserted between the plates of Area 80 m^2 with constant speed of 20 m/s as shown below. Distance between the plates is 10 mm .



Capacitor is connected to a battery of emf \mathcal{E} . The

Energy supplied by the source in 0.3 sec is $\underline{\hspace{2cm}} \text{ J}$

Q-4. for the above question draw the waveform of current $i(t)$ with respect to time

Q-5. The cross-section of a cable is shown in fig. The inner conductor has a radius of 10 mm and dielectric has thickness of 5 mm . The cable is 8 km long. The capacitance of cable is ($\log_e 1.5 = 0.4$)

(a) $3.8 \mu\text{F}$

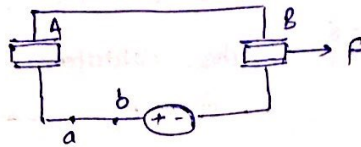
(b) $1.1 \mu\text{F}$

(c) $4.8 \times 10^{-10} \text{ F}$

(d) None



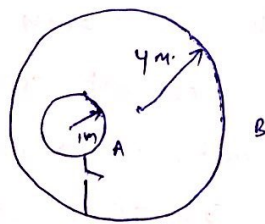
Q-6. Two identical capacitors with identical dielectric slabs in between them are connected in series as shown. Now the slab of one capacitor is pulled out slowly with the help of an external force F at steady state as shown. Which of the following statement is true



- Statement-1 During the process charge (positive) flows from b to a
 Statement-2 During the process, charge of capacitor B is equal to charge on plate A at all instants
 Statement-3 During the process, battery has been charged

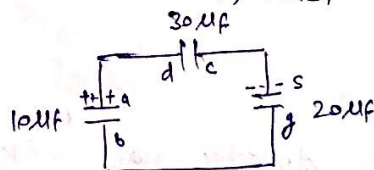
- (a) All statements are true (b) Statement 2 & 3 are true
 (c) Statement 1 & 2 are true (d) Statement 1 & 3 are true.

Q-7. Two hollow spherical conductors A & B are arranged as shown in fig. Conductor B is initially (before connecting A & B) neutral and charge on A is $Q = 2C$; After connecting, the potential of B is



- (a) 1.8×10^9 volt (b) 4.5×10^9 volt
 (c) -13.5×10^9 volt (d) Information insufficient

Q-8. Two capacitors of capacitance $10\mu F$ & $20\mu F$ are charged to potential $40V$ & $30V$ respectively. The plates of capacitors are connected as shown in fig. with one wire from each capacitor free. The upper plate of capacitor $10\mu F$ is +ve and that of $20\mu F$ is -ve. An uncharged capacitor of capacitance $30\mu F$ and lead wires falls on free ends to complete the circuit, then voltage of capacitor $30\mu F$ will be _____ volt.



Q-9. for the above question find the final sum of charge on plates b and g is _____ μC